CLAIMS:

1. A measurement cell for an FTMS spectrometer, comprising:

an excitation electrode arrangement positioned about a longitudinal axis which extends in a direction generally parallel to the field direction of an applied homogeneous magnetic field; and

a trapping electrode arrangement, also positioned about the said longitudinal axis, for trapping ions longitudinally in the cell within a trapping region defined by the trapping electrode arrangement;

wherein at least a part of the excitation electrode arrangement extends axially outwardly of the trapping region defined by the trapping electrode arrangement.

2. The measurement cell of claim 1, wherein the excitation electrode arrangement comprises a central excitation electrode part, arranged about a central point along the longitudinal axis, and first and second outer excitation electrode parts, axially spaced from the central electrode part along that axis, and wherein the trapping electrode arrangement comprises first and second trapping electrodes, located axially between the central excitation electrode part and the first and second outer excitation electrode parts respectively.

3. The measurement cell of claim 2, wherein the excitation electrode arrangement further comprises linking members extending in the longitudinal direction between the central electrode part and the first and

second outer excitation electrode parts respectively so as to provide an electrically conductive path between the first and second outer excitation electrode parts and the central excitation electrode part.

4. The measurement cell of claim 3, wherein the central excitation electrode part and the first and second outer excitation electrode parts each extend circumferentially by an amount which exceeds the circumferential extent of the linking members so that the excitation electrode arrangement forms a unitary member in which the first and second outer excitation electrode parts are each linked to the central excitation electrode part by relatively narrow linking members.

5. The measurement cell of claim 4, wherein the linking members, the central excitation electrode part and the first outer excitation electrode part together define a first aperture within the excitation electrode arrangement, wherein the linking members, the central excitation electrode part and the second outer excitation electrode part together define a second aperture within the excitation electrode arrangement, and further wherein the said first and second trapping electrodes are located within the said first and second apertures in the excitation electrode arrangement respectively.

6. The measurement cell of claim 1, wherein the excitation electrode arrangement extends along substantially the whole of the longitudinal axis of the cell, wherein the trapping electrode arrangement is

circumferentially displaced from the excitation electrode arrangement and extends along only a part of the longitudinal axis of the cell.

7. The measurement cell of claim 6, wherein the excitation electrode arrangement extends axially beyond the ends of the trapping electrode arrangement.

8. The measurement cell of any one of claims 1 to 5, further comprising a detection electrode arrangement for detecting ions trapped within the trapping region.

9. The measurement cell of claim 8, in which the detection electrode arrangement comprises one or more detection electrodes, the or each of which is circumferentially displaced from the excitation and trapping electrode arrangements.

10. The measurement cell of claim 8, in which the detection electrode arrangement comprises a plurality of detection electrodes each of which is generally aligned in the direction of the said longitudinal axis.

11. The measurement cell of claim 6 or claim 7, further comprising a detection electrode arrangement for detecting ions trapped within the trapping region.

12. The measurement cell of claim 11, in which the detection electrode arrangement comprises at least one detection electrode part circumferentially displaced from the excitation electrode arrangement but generally

circumferentially aligned with the trapping electrode arrangement.

13. The measurement cell of claim 12, wherein the or each detection electrode part is positioned axially inwardly of the trapping electrode arrangement.

14. The measurement cell of claim 12, in which the detection electrode assembly comprises a plurality of detection electrode parts, in which the trapping electrode arrangement comprises a plurality of trapping electrode parts, and in which the trapping and detection electrode parts are arranged alternately along the longitudinal axis, with the trapping electrode parts positioned between the detection electrode parts.

15. The measurement cell of claim 6, 7, 11, 12, 13 or 14, wherein the excitation electrode arrangement extends circumferentially over less than 50% of the total circumference of the measurement cell.

16. The measurement cell of claim 15, wherein the excitation electrode arrangement extends circumferentially over less than 15% of the total circumference of the measurement cell.

17. The measurement cell of claim 15 or claim 16, further comprises at least one additional excitation electrode arrangement circumferentially displaced from the first excitation electrode arrangement, and at least one additional trapping electrode arrangement

circumferentially displaced from each excitation electrode arrangement and also from the first trapping electrode arrangement, the excitation and trapping electrode arrangements being alternately arranged around the circumference of the cell.

18. The measurement cell of any one of the preceding claims, further comprising an r.f. voltage supply connected to the excitation electrode arrangement, and a d.c. voltage supply connected to the trapping electrode arrangements.

19. The measurement cell of claim 18, wherein the r.f. voltage supply is further connected to the trapping electrode arrangement.

20. The measurement cell of claim 19, wherein the r.f. voltage supply and the d.c. voltage supply are decoupled.

21. The measurement cell of claim 20, wherein the r.f. voltage supply is capacitively and/or inductively coupled to the trapping electrode arrangement.

22. The measurement cell of any one of the preceding claims, wherein the excitation electrode arrangement and the trapping electrode arrangement are each equidistantly radially spaced from the longitudinal axis of the measurement cell.

23. The measurement cell of any one of claims 1 to 21, wherein the excitation electrode arrangement comprises a plurality of excitation electrode parts, and wherein at least one of the excitation electrode parts is radially spaced from the longitudinal axis at a first distance which is different to that of the or each of the other excitation electrode parts.

24. The measurement cell of any one of the preceding claims, further comprising end caps arranged axially outwardly of the trapping and excitation electrode arrangements.

25. The measurement cell of claim 24, wherein the end caps are located along the longitudinal axis of the cell so as partially to enclose a volume therebetween.

26. The measurement cell of claim 1, wherein the excitation electrode arrangement comprises:

a first pair of curved excitation electrode parts arranged symmetrically about the longitudinal axis of the cell and about a central point along that longitudinal axis;

second and third pairs of curved excitation electrode parts each arranged symmetrically about the longitudinal axis of the cell, and equidistantly spaced along that axis about the central point thereof; and

first and second pairs of curved trapping electrode parts, arranged symmetrically about the longitudinal axis, each trapping pair being arranged between the first pair of curved excitation electrode parts and the second

and third pairs of curved excitation electrode parts respectively;

the cell further comprising a pair of detection electrodes radially spaced about the longitudinal axis of the cell with respect to the excitation and trapping electrode parts, and having a diameter similar to the said excitation and trapping electrode parts.

27. A Fourier Transform Mass Spectrometer including the measurement cell of any of claims 1 26.

28. A method of trapping and exciting ions in a measurement cell of an FTMS spectrometer, the method comprising:

(a) applying a magnetic field to the measurement cell so as to produce a region of homogeneous magnetic field, having a magnetic field direction, within the cell;

(b) applying a d.c. trapping potential to a plurality of trapping electrode arrangement positioned about a longitudinal axis which extends in a direction generally parallel to that magnetic field direction, so as to trap ions in the cell, in that axial direction within a trapping region defined by the trapping electrode arrangement; and

(c) applying an r.f. excitation potential to an excitation electrode arrangement positioned about that longitudinal axis, so as to resonantly excite the ions in the cell, at least a part of the excitation electrode arrangement extending axially outwardly of the trapping region defined by the trapping electrode arrangement;

wherein the ions are trapped within the region of homogeneous magnetic field and wherein the ions are further trapped within a homogeneous region of an excitation electric field generated by the application of the r.f. excitation potential to the said excitation electrodes.

29. The method of claim 28, further comprising:

applying an r.f. excitation potential to the trapping electrode arrangement in addition to the d.c. trapping potential applied thereto.

30. The method of claim 29, wherein the step of applying the r.f. excitation potential to the trapping electrode arrangement comprises coupling the r.f. excitation potential to the trapping electrode arrangement via a capacitance and/or an inductance.

31. The method of claim 28, further comprising, prior to at least one of the steps (a), (b) and (c):

applying a d.c. trapping potential to the excitation electrode arrangement so as to generate a first ion trapping field; and

subsequently removing the said d.c. trapping potential from the excitation electrode arrangement to which it has been applied.